chairman of the governing body, will take the chair at 8 p.m.

COPIES of the general and departmental reports on the work of Bradford Technical College for the session 1906–7 presented to the Higher Education Subcommittee of the city have been received. The principal of the college appeals to employers of labour in the city to recognise the efforts made by those in their employ who desire to obtain instruction in evening classes, and urges masters to make arrangements to liberate students during the time the classes meet. The work of the department of textile industries is exerting a beneficial influence on the trade of Bradford. The demand for students trained in the department, and the increasing tendency of combers, spinners, and manufacturers to appeal to the college in cases of difficulty, have been very marked during the session. The reports contain other indications that the college is assisting the various industries in its neighbourhood.

AT the recent annual convocation of the University of Allahabad for conferring degrees, the Vice-Chancellor, Rai Sunder Lal Bahadur, delivered an address on the need for higher technical education in the United Provinces. Referring to the conference which sat in August last at Naini Tal to consider important questions in connection with technical education, the Vice-Chancellor said, we learn from the *Pioneer Mail*, that "among the matters which engaged the attention of the conference was the suggestion for the establishment of a high-class technological institute for research and instruction, where students could receive instruction in chemical technology, mechanical engineering, and other kindred subjects. The cost of maintaining an institution like this will be large. According to Sir Norman Lockyer," continued the Vice-Chancellor, "for the up-keep of seven out of twenty-two universities, the annual sum found in Germany chiefly by the State comes up to 271,000*l*. When these figures are borne in mind, the cost of the proposed institute ought not to stand in the way of its establishment. Its advantages will abundantly repay the outlay. It will provide an opening for graduates in science, and will divert many of them to the useful paths of industry and research. In such an institution graduates, who have studied the general principles of science in colleges, will be able to master the various methods of the practical application of science to the needs of the present day. They will there learn with what extraordinary skill, in other and more advanced countries, men are 'harnessing science in the service of business and the other tasks of modern life.'"

THE Earl of Crewe, chairman of the governing body of the Imperial College of Science and Technology, has authorised the publication of the following communication:—The governing body of the Imperial College of Science and Technology has appointed three standing committees, a finance committee (chairman, Sir Francis Mowatt), an education committee (chairman, Mr. Arthur Acland), and a general purposes committee (chairman, Lord Halsbury). In addition, two temporary committees have been appointed, namely, a transfer committee (chairman, Mr. Arthur Acland), and an organisation committee (chairman, Mr. Gerald Balfour; vice-chairman, Sir William White). Matters relating to the transfer to the Imperial College of the constituent institutions, which it has been arranged shall take effect as from January 1 next, and to the transfer of land from the Exhibition Commissioners, have been referred to the transfer committee. The organisation committee, to which have been referred matters relating to the future organisation of the Imperial College, has appointed four subcommittees to consider questions arising under this head in relation to the following sciences or groups of sciences, viz.:—(1) mining and metallurgy (chairman of the subcommittee, Sir Julius Wernher); (2) other branches of engineering (chairman, Sir John Wolfe-Barry); (3) biological sciences (chairman, Sir Archibald Geikie); and (4) other pure and applied sciences (chairman, Sir Arthur Rücker). The governing body has authorised the appointment of persons not members of the governing body who are specially conversant with the sciences in question or with their industrial applications as additional members of these subcommittees, which are now engaged in considering the questions referred to them. The governing body has also approved in principle the appointment of a principal officer of the Imperial College, and has referred the question of his title and functions to the organisation committee.

SOCIETIES AND ACADEMIES.

LONDON.

Society of Chemical Industry, November 4.—Mr. R. J. Friswell in the chair.—The determination of indigotin in indigo-yielding plants: Cyril **Bergtheil** and R. V. **Briggs.** The accurate determination of indigotin in the indigo plant is of considerable importance, since a correct estimate of the efficiency of the process of indigo manufacture depends thereon. A method of precipitating indigotin from an extract of the plant in boiling water by means of ammonium persulphate, proposed by Rawson in 1904 and modified by the present authors, has been shown to give correct results by comparison with those obtained by fermentation of the extract by means of the indigo enzyme (Journ. Soc. Chem. Industry, 1906, xxv., 729). This method has been criticised by Orchardson, Wood and Bloxam, and two alternative methods proposed, one of which, depending on the same principle, is said to give results identical with those obtained by the authors' method, whilst the other, depending on the precipitation of indirubin by the action of isatin in acid solution, indicates a considerably higher potential yield of indigotin in the plant extract used (Journ. Soc. Chem. Industry, xxvi., 4). The authors' original method is now verified, and some minor modifications are recommended. The conclusion that the isatin method may in certain circumstances indicate a higher indican content in a given extract than the persulphate method is not borne out by the authors' experiments.—Analysis of indigo (part iii.) and of the dried leaves of *Indigofera arrecta* and *I. Sumatrana*: R. **Gaunt,** F. **Thomas,** and W. P. **Bloxam.** A summary is first given of the results of the work on indigo carried out for the Government of India at the University of Leeds during the years 1905–7. In the present paper the exact conditions were prescribed for the preparation of pure indigotin to serve as the standard on which the tetrasulphonate process for the estimation of indigotin is based. A reply was made to certain criticisms on the tetrasulphonate process; the defects complained of were shown to be due to want of proper precaution on the part of the operators. The methods in use for the estimation of indigotin in the leaf were described. The persulphate method was found altogether faulty, as the results obtained by it were too low. The new "isatin" method was found to give much higher results, and, moreover, the method is quantitative, as proved by its action on the glucoside indican, which has recently been isolated in quantity by Messrs. A. G. Perkin and W. P. Bloxam. As a result of employing the isatin process, the indigo leaf is demonstrated to be capable of yielding more indigotin than had previously been supposed. Again, the percentage of leaf present in the green plant has been underestimated in India. It is insisted that these facts are in favour of the survival of the Indian indigo industry. Finally, it was submitted that the work on the indigo ferment or enzyme had not been properly followed out, and that the present reports on the Indian manufacture are eminently unsatisfactory, for (1) the colour-giving value of the raw materials was seriously underestimated, whilst (2) the indigotin value of the manufactured cake was overestimated, and this owing to the persistent use of unsatisfactory methods of analysis in lieu of adopting the tetrasulphonate process.

Physical Society, November 8.—Dr. C. Chree, F.R.S., vice-president, in the chair.—A freehand graphic way of determining stream surfaces and equipotentials: L. F. **Richardson.** Where an accuracy of 1 per cent. to 3 per cent. of the range is sufficient, solutions of the equation

$$\frac{\partial^2 V}{\partial x^2}+\frac{\partial^2 V}{\partial y^2}+\frac{\partial^2 V}{\partial z^2}=0$$

may be obtained by drawing equipotentials and sections of stream surfaces, and amending them freehand until the chequers which they form take the appropriate shape at each point of the field. The method can only be applied in certain types of symmetry, as where V is constant along each line of one or other of the following families of lines:—(1) parallel straight lines; (2) circles with their centres on a common axis and their planes normal to this axis; (3) radii from a point; (4) the normals common to the two surfaces of a thin shell of any shape; and (5) a certain family of screw-threads. It is doubtful whether there are any other possible types. Within these five types of symmetry the freehand method far surpasses analytical methods in its adaptability to boundaries and boundary conditions of almost any shape which can be drawn on paper. It can no doubt be extended to deal with conductivity which depends on position, on the potential, or on the force.—The lateral vibration of bars supported at two points with one end overhanging: Dr. J. **Morrow.** When a bar, supported at one end and at some other point in its length, vibrates under its own mass only, the expression from which the frequency can be determined is of considerable complexity. When different values are assumed for the ratio of the overhanging length to the distance between the supports, the expression reduces to a customary form with a coefficient depending on this ratio. This coefficient is given here to six figures for different ratios from zero to unity. The results show that Dunkerley's approximate values cannot be relied on to more than two figures, and that Chree's simple formula gives remarkable accuracy for cases in which the overhanging length is less than half the span.

Zoological Society, November 12.—Dr. F. DuCane Godman, F.R.S., vice-president, in the chair.—Mammals collected at Beira by Mr. C. H. B. Grant, being No. 8 of the series of papers on the Rudd exploration of South Africa: Oldfield **Thomas** and R. C. **Wroughton.** Twenty-eight species were included in the collection, represented by 127 specimens, all, as before, presented to the National Museum by Mr. C. D. Rudd. The region not having been previously worked, the series was of much interest from a geographical point of view.—The feeding of serpents in captivity: Dr. P. C. **Mitchell** and R. I. **Pocock.** The different habits of python-like, non-poisonous and poisonous colubrine and viperine snakes were described, and it was stated that no evidence was found as to the existence of a specific fear of snakes in the case of any vertebrates except Primates, and that, amongst Primates, lemurs were distinguished from true monkeys by their complete indifference to snakes.—Descriptions of some new loricariid fishes, viz. five species of Plecostomus and an Otocinclus from eastern Brazil, and two species of Arges from Colombia: C. Tate **Regan.**—Notes on Mayer's pigeon: Lieut.-Colonel N. **Manders.** The habits of this nearly extinct bird were described.—Observations on the structure of the rare Madagascar mammal, *Galidictis striata*: F. E. **Beddard.**

Institution of Mining and Metallurgy, November 21.—Prof. W. Gowland, president, in the chair.—The deviation of Rand bore-holes from the vertical: J. **Kitchin.** Although there are altogether 235 bore-holes sunk in the Witwatersrand area, of which forty-five have reached a depth of 3000 feet or more, the author has contented himself with a review of twenty-two only, in respect to which results sufficiently full for tabulation are available. As regards these, the general characteristics were such that he has tabulated the following ascertained effects:—(1) the bore-holes almost invariably deviate in a northerly direction; (2) they almost invariably deviate against the strata; (3) the deviation tends to be greatest when the dip is least; (4) the deviation is not confined to any particular spot or spots in the bore-holes, but seems in most cases to be more or less general throughout; and (5) there is no appreciable deviation in the case of the flat-lying surface dolomite and any amygdaloidal diabase underlying it, or in the case apparently of surface igneous rock, but in all other instances the deviation is usually marked, and its rate of increase comparatively uniform. In other words, deviation is not observed except where the rocks passed through are bedded and have a dip. The average horizontal displacement of the twenty-two bore-holes specially submitted for analysis was 440 feet at a depth of 2000 feet, the minimum being 160 feet in a bore-hole 2000 feet deep, and the maximum 2370 feet in a bore-hole 4200 feet deep. As an appendix, the author gave particulars of a further twenty bore-holes, data of which were less detailed.—The separation of tin-oxide from wolfram: A. **Treloar** and G. **Johnson.** A record of experiments made by the authors in Cornwall upon "tinny-wolfram" with the view of saving the tin left in the product of the magnetic separator. The most successful results were obtained by taking the separated product in a dry state and boiling it in dilute sulphuric acid, which in a fairly large-scale experiment gave an extraction of 20 per cent. of tin-oxide. Hitherto, since the introduction of magnetic separation for Cornish ores, large quantities of tin-oxide have been given away in the parcels of wolfram sold, owing to a lack of means to effect this further separation from the tinny-wolfram.

PARIS.

Academy of Sciences, November 23.—M. Henri Becquerel in the chair.—Remarks concerning the nitrous isomerisation of isobutyl alcohol: Louis **Henry.** The conversion of the hydrochlorides of the fatty amines into alcohols by sodium nitrite results in the simple replacement of the (NH_2) group by (OH) for methylamine and ethylamine. Higher members of the series undergo a more complicated change, isomeric alcohols being produced. Isobutylamine gives isobutyl alcohol,

$$(CH_3)_2.CH.CH_2.OH,$$

and trimethylcarbinol, $(CH_3)_3.C.(OH)$, the proportion of the latter (about three-quarters) being determined by converting it into tertiary butyl chloride.—The determination of the solar elements and the masses of Mars and Jupiter by meridian observations of Vesta: G. **Leveau.** The whole of the observations made at Greenwich and Paris between the years 1807 and 1904, and numbering 5440, are utilised, and the results compared with those of Le Verrier and Newcomb.—Observation of the passage of Mercury across the sun's disc made with the Gautier equatorial (40 cm.) at the National Observatory of Athens: D. **Eginitis.** The atmospheric conditions at Athens were bad, and accurate measurements, in consequence, were impossible. The brilliant ring round the disc of Mercury observed in the transit of 1891 was not seen on this occasion.—The order of the function $D(\lambda)$ of Fredholm: T. **Lalesco.**—Some points in the theory of fundamental functions relating to certain integral equations: Bryon **Heywood.**—The irregular points of convergent series of analytical functions: P. **Montel.**—Some properties of integrals passing through a singular point of a differential equation: H. **Dulac.**—The rotatory magnetic dispersion of crystals in the neighbourhood of absorption bands: Jean **Becquerel.**—Influence of the reaction of the medium on the size of the colloidal granules: André **Mayer,** G. **Schæffer,** and E. **Terroine.** Numerous examples are given showing that the addition of traces of acid to negative colloidal solutions, or of alkalies to positive solutions, has the effect of increasing the size of the colloidal granules.—A new compound of uranium, the tetra-iodide: Marcel **Guichard.** Metallic uranium and iodine are sealed up in a vacuous tube, the iodine being heated to 180° C. and the uranium to 500° C.; the iodide UI_4 is thus formed. It is unstable, and readily acted upon by moisture or oxygen.—The synthesis of ammonia by catalysis starting from its elements: Léon **Brunel** and Paul **Woog.**—A method for estimating very small quantities of zinc: Gabriel **Bertrand** and Maurice **Javillier.** The method is based upon the insolubility of calcium zincate, and allows of the separation of 0·1 mg. of zinc from three litres of solution, a dilution of 1 in 30,000,000.—Lupeol: P. **van Romburgh.** A comparison of the lupeol obtained from *bresk* (the juice of *Dyera Lowii*) with that extracted as cinnamate from the gutta-percha of *Palaquium Treubii.*—Two isomeric methylsparteines: Charles **Moureu** and Amand **Valeur.** An account of two isomeric bases obtained by the decomposition of α-methylsparteinium hydrate.—Experiments on the synthesis of β-campholene lactone and on the lactone of 2 : 4-dimethyl*cyclo*pentanol-2-acetic acid: G. **Blanc.**—The primitive form of the male fig: Leclerc **du Sablon.**—The signification of the reddening ("maladie du Rouge") of the fir: L. **Mangin.**—A remarkable case of autotomy of the floral peduncle of the tobacco plant, caused by traumatism of the corolla: Paul **Becquerel.**—Contribution to the anatomical study of some textile Cyperaceæ of Madagascar: P. **Claverie.**—Contribution to the chemical study of mistletoe, *Viscum album*: M. **Leprince.** An account of the method of isolating an alkaloid from this plant, 25 kilograms of the dried material giving 1·6 grams of the chlorohydrate of the base, $(C_8H_{11}N)HCl$.—The physiological action of the mistletoe, *Viscum album*: Réne **Gaultier** and J. **Chevalier.**—A new sign of true death: E. de Bourgade **de la Dardye.** Referring to a communication by M. Vaillant in the last number of the *Comptes rendus*, the author refers to a communication of his on the same subject published in 1898, in which the immobility of the heart, diaphragm, and intestines after death showed up clearly in radiographs.—Artificial parthenogenesis: Jacques **Loeb.** Criticisms of the work of M. Delage on the same subject.—The comparative morphology of *Pachydavularia erecta* and *Suavopsis elegans*: Louis **Roule.**—The diagnosis of tuberculosis in animals, especially in cattle, by the simultaneous use of the ophthalmo- and cutidermo-reaction: J. **Lignières.**—The comparison of the secretions of the two kidneys in hydruric diabetes: C. **Fleig** and E. **Jeanbrau.**—Tuberculosis cultures *in vivo* and antituberculous vaccination: M. **Moussu.**—The sterilisation of the human ovary by the X-rays: Foveau **de Courmelles.**—The individualisation, graduation, and methodical localisation of the altitude cure applied to the treatment of tuberculosis: Christian **Beck.** The author proposes to send the patients up in groups attached to captive balloons.—The systematic position of the fossil stems known as Psaronius, Psaroniocaulon, Caulopteris: Fernand **Pelourde.**

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 5.

ROYAL SOCIETY, at 4.30.—Experiments in Optics: Prof. A. A. Michelson, For.Mem.R.S.—Reciprocal Innervation of Antagonistic Muscles. Eleventh Note, Further Observations on Successive Induction: Prof. C. S. Sherrington, F.R.S.—On the Distribution of the Different Arteries supplying the Human Brain: Dr. C. E. Beevor.—Localisation of Function in the Lemur's Brain: Dr. F. W. Mott, F.R.S., and Prof. W. D. Halliburton, F.R.S.—On the Supposed Extracellular Photosynthesis of Carbon Dioxide by Chlorophyll: Prof. A. J. Ewart.—The Influence of Increased Barometric Pressure on Man, No. 4, The Relation of Age and Body Weight to Decompression Effects: L. Hill, F.R.S., and M. G. Greenwood, jun.—On the Present Distribution and Origin of the Calcareous Concretions in Coal Seams known as "Coal Balls": Miss Stopes and D. M. S. Watson.—On the Structure of *Sigillaria Scutellata*, Brongn., and other Eusigillarian Stems, in Comparison with those of other Palæozoic Lycopods: E. A. Newell Arber and H. H. Thomas.

CHEMICAL SOCIETY, at 8.30.—The Affinity Constants of Bases as Determined by Methyl Orange. Preliminary Communication: V. H. Veley.—The Velocity of Reduction of the Oxides of Lead, Cadmium, and Bismuth by Carbon Monoxide, and the Existence of the Suboxides of these Metals: F. J. Brislee.—The Relation between Unsaturation and Optical Activity, Part i., The Menthyl and Bornyl Esters of β-Phenylpropionic, Cinnamic, and Phenylpropiolic Acids: T. P. Hilditch.—The Constituents of the Essential Oil of Nutmeg: F. B. Power and A. H. Salway.—Methyl Ethers of some Hydroxy-anthraquinones: A. G. Perkin.—The Colouring Matters of the Stilbene Group, Part iv., The Action of Caustic Alkalies upon Paranitrotoluene and its Derivatives: A. G. Green, A. H. Davies, and R. S. Horsfall.—The Replacement of Alkyl Radicals by Methyl in Substituted Ammonium Compounds: H. O. Jones and J. R. Hill.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Automatic Cab-signalling on Locomotives: J. Pigg.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Retaining Walls: A. T. Walmisley.

LINNEAN SOCIETY, at 8.—Report on Alcyonaria of the Sudanese Red Sea: Prof. J. Arthur Thomson.—Report on the Crinoidea of the Sudanese Red Sea: H. C. Chadwick.—Notes on some Marine Algæ from the Red Sea: Prof. R. J. Harvey Gibson.—*Exhibitions*:—Specimens of *Spartina Townsendi*, as illustrating its Distribution in Britain: Dr. Otto Stapf.—Lantern Slides showing Stages of Soil-denudation consequent on the Removal of Forests: A. P. Young.

FRIDAY, DECEMBER 6.

GEOLOGISTS' ASSOCIATION, at 8.—Notes on the Geology of the Tenby District, with Special Reference to the Carboniferous Limestone: A. L. Leach.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Methods of Vaporising Liquid Fuels, used with Internal-Combustion Engines, as Applied to Road Vehicles: R. T. Deane.

MONDAY, DECEMBER 9.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Jamaica Earthquake and After: Dr. Vaughan Cornish.

SOCIETY OF ARTS, at 8.—The Theory of the Microscope: Conrad Beck.

SOCIOLOGICAL SOCIETY, at 8.—The Problem of Education, a Criticism of Principles, Curricula and Methods: A. E. Crawley.

VICTORIA INSTITUTE, at 4.30.—On Primeval Man in Belgium: Rev. D. Gath Whitley.

TUESDAY, DECEMBER 10.

ZOOLOGICAL SOCIETY, at 8.30.—On the Origin of the Mammal-like Reptiles: Dr. R. Broom.—A Revision of the African Silurid Fishes of the Subfamily Clariinæ: G. A. Boulenger, F.R.S.—On a Hæmogregarine from the Blood of a Himalayan Lizard (*Agama tuberculata*): Prof. E. A. Minchin.

JUNIOR INSTITUTION OF ENGINEERS, at 8.—Arc Lighting: W. Krause.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Predetermination of Train Resistance: C. A. Carus-Wilson.

WEDNESDAY, DECEMBER 11.

SOCIETY OF ARTS, at 8.—Radio-active Phenomena: Sir William Ramsay, K.C.B., F.R.S.

THURSDAY, DECEMBER 12.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Preliminary Note on the Operational Invariants of a Binary Quantic: Major MacMahon, F.R.S.—Further Consideration of the Stability of the Pear-Shaped Figure of Equilibrium of a Liquid Earth: Sir G. H. Darwin, K.C.B., F.R.S.—The Action of Ozone on Water-colour Pigments: Sir W. Abney, K.C.B., F.R.S.—On Kinetic Stability: Prof. H. Lamb, F.R.S.—The Absorption Spectra of the Vapours of Benzene and its Homologues at Different Temperatures and Pressures, and likewise of Solutions of Benzene: Prof. W. N. Hartley, F.R.S.—The Spectrum of Magnesium and of the so-called Magnesium Hydride as obtained by Spark Discharges under Reduced Pressure: E. E. Brooks.—Magnetic Declination at Kew Observatory, 1890 to 1900: Dr. C. Chree, F.R.S.—The Effects of Temperature and Pressure on the Thermal Conductivities of Solids. Part ii., The Effect of Low Temperatures on the Thermal Conductivities of Pure Metals and Alloys: Prof. C. H. Lees, F.R.S.—On Exterior Ballistics, No. 2: Prof. G. Forbes, F.R.S.

SOCIETY OF ARTS, at 4.30.—Big Game in India: R. Gilbert.

FRIDAY, DECEMBER 13.

MALACOLOGICAL SOCIETY, at 8.—Additions to the Marine Molluscan Fauna of New Zealand, with Descriptions of New Species: H. Suter.—Alteration to the name of *Mitra recurva*, Sow. (preoccupied): G. B. Sowerby.—Descriptions of New Species of Fresh-water Shells from Central Africa: C. A. Smith.—New Land and Marine Shells from West Africa: H. B. Preston.

SOCIETY OF ARTS, at 8.—Industrial Poisons—Lead and Phosphorus—with Special Reference to the Manufacture of Lucifer Matches: Prof. T. Oliver.

PHYSICAL SOCIETY, at 7–10.—Exhibition of Electrical, Optical, and other Physical Apparatus.

ROYAL ASTRONOMICAL SOCIETY, at 5.

SATURDAY, DECEMBER 14.

ESSEX FIELD CLUB (at Essex Museum of Natural History, Stratford), at 6.—Conference on Rivers Pollution from the Naturalist's Point of View: Opened by Prof. R. Meldola, F.R.S.

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